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Globoramichloridium delicatum and *Heteroconium simile* spp. nov. from southern China

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ABSTRACT — Two new anamorphic fungi, *Globoramichloridium delicatum* and *Heteroconium simile*, collected from dead branches of unidentified broadleaf trees in Jiangxi Province, China, are described and illustrated. *Globoramichloridium delicatum* is characterized by unicellular, subglobose to narrow subnapiform, yellowish-green conidia. *Heteroconium simile* is distinguished by its monoblastic, integrated, terminal, determinate conidiogenous cells that produce acrogenous, blastocatenate, dimorphic, 0–1-septate, smooth conidia.

KEY WORDS—*Antennulariellaceae, Dissoconiaceae, Dothideomycetes,* hyphomycetes, taxonomy

Introduction

Saprobic dematiaceous hyphomycetes are highly diverse on rotting woody plant materials (Xia & al. 2014, 2016). As essential components in forest ecosystems, they play important roles in nutrient recycling, but their geographical distribution and alpha taxonomy are poorly known. In order to enrich the inventory of saprobic dematiaceous hyphomycetes in China, several studies on fungi occurring on dead branches have been conducted during the last 15 years (Zhang & Shi 2005; Ma & Zhang 2007, 2015; Ma & al. 2008, 2014, 2016; Zhang & al. 2009, 2014; Xia & al. 2012, 2015; Xu & al. 2017, 2019; Qiu & al. 2020).

Jinggangshan Mountain is a small range in southeast Jiangxi, China. It lies in the center part of Luoxiao Mountains, which border both Hunan and Jiangxi provinces. Its scenic area covers c. 260 km^2 and exhibits complex geographical and topographical conditions with an 81.2% forest coverage rate and a 14.2 °C annual average temperature. It is considered one of the world's most abundant biological areas within this latitudinal zone. A field trip was made to Jinggangshan Mountain to collect saprobic hyphomycetes in November 2014. Two new species with morphologic features typical of *Globoramichloridium* Y. Marín & Crous (Marin-Felix & al. 2019; *Dissoconiaceae*) and *Heteroconium* Petr. (Petrak 1949; *Antennulariellaceae*) were collected on dead branches. The two new fungal species are described and illustrated below.

Materials & methods

Dead branches were collected from humid environments and watersides in the forest ecosystems of Jinggangshan Mountain and placed in Ziploc™ plastic bags for transport to the laboratory, where they were processed, and examined as described by Ma & al. (2011). Microphotographs were prepared using a Nikon Eclipse E200 microscope equipped with a SmartV550Dc digital camera, with a 100× (oil immersion) objective at the same background and scale. Conidia were measured at their widest point. The range between minimum and maximum values for microscopic measurements is given with outliers in parentheses. Adobe Photoshop 7.0 was used to assemble photographs into plates. The specimens are deposited in the Herbarium of Jiangxi Agricultural University, Plant Pathology, Nanchang, Jiangxi, China (HJAUP).

Taxonomy

Globoramichloridium delicatum L. Qiu, Jian Ma, R.F. Castañeda & X.G. Zhang, **sp. nov.** FIG. 1

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Differs from *Globoramichloridium indicum* by its larger unicellular subglobose to narrow subnapiform yellowish green conidia.

TYPE: China, Jiangxi Province: Jinggangshan Mountain, Shuikou scenic spot, 26°33′03″N 114°07′55″E, on dead branches of an unidentified broadleaf tree, 6 Nov. 2014, J. Ma (**Holotype**, HJAUP M0217).

ETYMOLOGY: Latin, *delicatum*, meaning "delicate", referring to the dainty conidia.

COLONIES on the natural substratum, effuse, brown. Mycelium superficial and immersed composed of branched, septate, pale brown or brown,

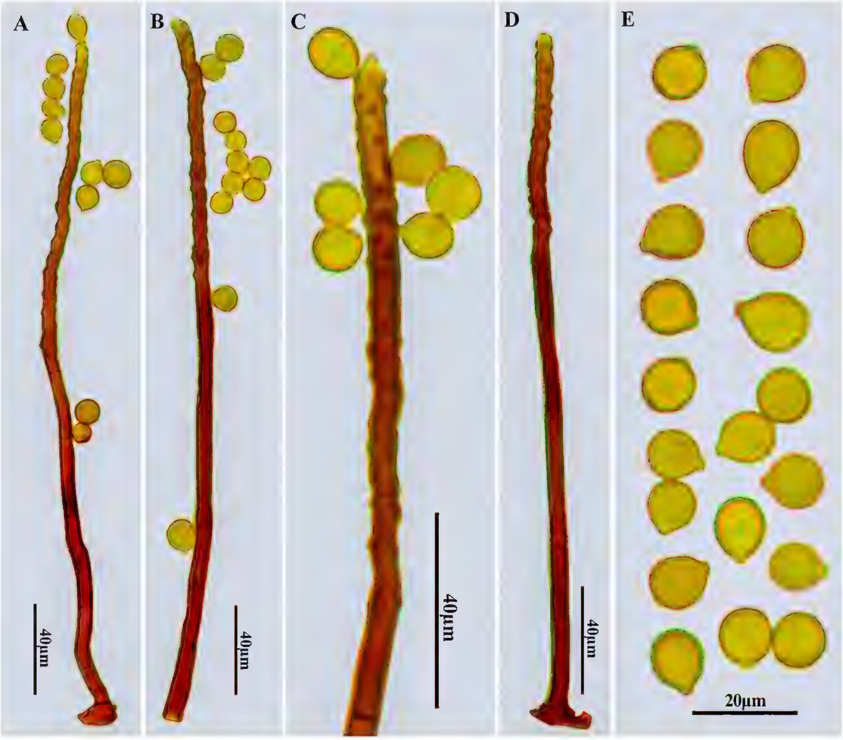

Fig. 1. *Globoramichloridium delicatum* (holotype, HJAUP M0217).
A–C. Conidiophores, conidiogenous cells, and conidia; D. Conidiophore; E. Conidia.

smooth-walled hyphae. Conidiophores macronematous, mononematous, unbranched, erect, straight or flexuous, cylindrical, 4–9-septate, smooth, brown to dark brown, paler towards the apex, ≤310 μm long, 6–8 μm wide. Conidiogenous cells polyblastic, integrated, terminal, sympodial extended, with crowded, prominent, thickened, slightly melanized scars. Conidia solitary, acropleurogenous, subglobose to narrow subnapiform, unicellular, yellowish green, verrucose or smooth, dry, 11–14 × 9.5–13 μm, truncate at the base, 1–2 μm wide, with a conspicuous 1 μm long hilum.

Comments –The monotypic genus *Globoramichloridium* was erected based on molecular phylogenetic analysis, with *Chloridium indicum* Subram. (Subramaniam 1955) [≡ *Globoramichloridium indicum* (Subram.) Y. Marín & Crous] as its type (Marin-Felix & al. 2019). *Globoramichloridium* is characterized by broadly ellipsoidal to globose, (0–)1-septate, smooth-walled or coarsely verrucose conidia seceding schizolytically from polyblastic, integrated, terminal, sympodial, geniculate or nodose conidiogenous cells with prominent, thickened and darkened scars (Marin-Felix & al. 2019). These morphological characteristics differ from the similar genus *Ramichloridium* Stahel ex de Hoog (de Hoog & Hermanides-Nijhof 1977), which has conspicuous conidiogenous loci with crowded or scattered, unpigmented to faintly pigmented, or slightly prominent denticles, thin scars, and clavate or oblong to ellipsoid, or obovate to obconical, aseptate, smooth-walled to finely verrucose conidia (Arzanlou & al. 2007, Seifert & al. 2011).

Globoramichloridium was previously known only from the type species, *G. indicum* [≡ *Chloridium indicum*; ≡ *Veronaea indica* (Subram.) M.B. Ellis; ≡ *Ramichloridium indicum* (Subram.) de Hoog], which has been reported from Australia, Cuba, Hong Kong, Malaysia, and Brazil (Castañeda-Ruíz 1986, GBIF 2020). *Globoramichloridium delicatum*, the second species of the genus, differs from *G. indicum*, which has smaller [(5–)7–8(–10) × (4–)6–6.5(–9) µm], broadly ellipsoidal to globose, (0–)1-septate, subhyaline to pale brown conidia (Arzanlou & al. 2007).

Heteroconium simile L. Qiu, Jian Ma, R.F. Castañeda & X.G. Zhang, **sp. nov.** FIG. 2

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Differs from *Heteroconium ponapense* and *H. indicum* by its shorter or smaller, 0–1-septate, dimorphic conidia that are obviously constricted at the septum.

TYPE: China, Jiangxi Province: Jinggangshan Mountain, Shuikou scenic spot, 26°33′03″N 114°07′55″E, on dead branches of an unidentified broadleaf tree, 6 Nov. 2014, J. Ma (**holotype**, HJAUP M0218).

ETYMOLOGY: Latin, *simile*, referring to its similarity to *Heteroconium ponapense* and *H. indicum.*

COLONIES on the natural substratum effuse, dark brown. Mycelium partly superficial, partly immersed, composed of branched, septate, pale brown, smooth hyphae. CONIDIOPHORES macronematous, mononematous, simple or branched, erect, straight or flexuous, cylindrical, smooth, brown to dark brown at the base, and paler towards the apex, 2–7-septate, 28–72 × 3–5 µm. CONIDIOGENOUS CELLS monoblastic, integrated, terminal, cylindrical, brown, smooth, 10–14 × 3.5–4.5 µm. Conidial secession schizolytic. CONIDIA acrogenous, blastocatenate, 11–15 × 4–5 µm, smooth, 0-1-septate, dimorphic, i) unicellular, ellipsoidal, fusiform, or ovoid, truncate at both ends or truncate at the base and rounded at the apex, concolorous, pale brown to dark brown,

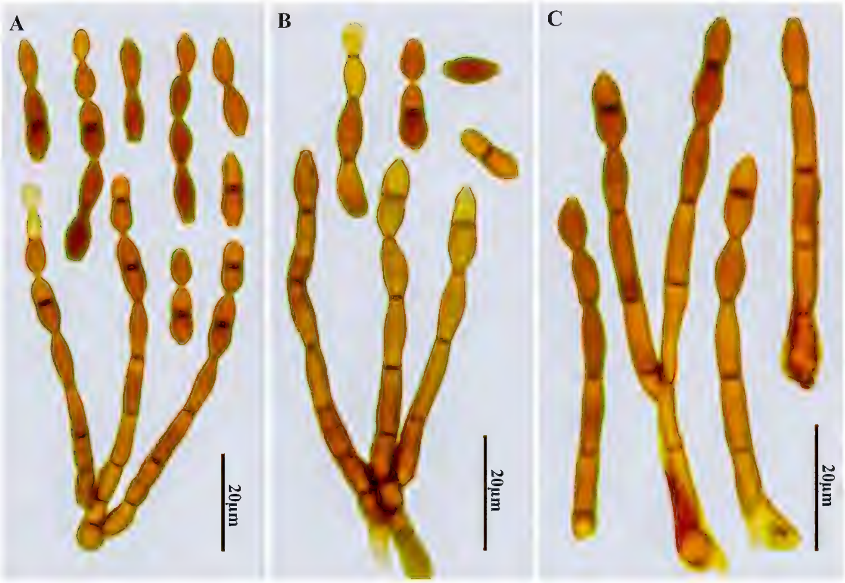

Fig. 2. *Heteroconium simile* (holotype, HJAUP M0218).
A–C. Conidiophores, conidiogenous cells, and conidia.

ii) bicellular, constricted at the septum, obcalceiform, ellipsoidal to obclavate, mostly bicolorous, basal cell brown or dark brown basal, apical cell pale brown or brown.

Comments –*Heteroconium* was erected by Petrak (1949) with *H. citharexyli* Petr. as type species. It is characterized by macronematous, mononematous, usually unbranched conidiophores, sometimes with a secondary branch originating after conidial secession or near percurrent regeneration. The conidiogenous cells are monoblastic, integrated, terminal, determinate or sometimes percurrent extended and produce acrogenous, blastocatenate, euseptate conidia that secede schizolytically (Petrak 1949; Ellis 1971; Castañeda & al. 1999, 2008; Taylor & al. 2001; Ma & al. 2012b).

Twenty-five *Heteroconium* epithets were listed in Index Fungorum (2020). However, *H. tetracoilum* (Corda) M.B. Ellis was transferred to *Lylea* Morgan-Jones due to its distoseptate conidia (Ellis 1976, Holubová-Jechová 1978). *Heteroconium solaninum* (Sacc. & P. Syd.) M.B. Ellis is not congeneric with *H. citharexyli;* it has an obligate association with asterinaceous fungi and different conidial septation sequence and was designated as the type species of *Pirozynskiella* S. Hughes (Ellis 1976, Hughes 2007). *Heteroconium chaetospira* (Grove) M.B. Ellis, *H. eucalypti* Crous & M.J. Wingf., and *H. kleinzeense* Crous & Z.A. Pretorius were transferred to other genera (*Cladophialophora* Borelli; *Thyrinula* Petr. & Syd.; *Alysidiella* Crous) based on molecular phylogenetic analyses (Ellis 1976; Crous & al. 2006, 2007a,b, 2019; Cheewangkoon & al. 2012). Although *H. queenslandicum* Matsush. is a currently accepted name, this species exhibits a similar conidial ontogeny with *Parapleurotheciopsis* P.M. Kirk in its holoblastic conidia with an acropetal branched chain through an apical ramoconidium that secedes schizolytically (Matsushima 1989, MycoBank 2020); these characters were remarked by Castañeda-Ruíz & al. (2008). Thus, *Heteroconium* currently contains 19 species, among which 11 species have been recorded from China: *H. annesleae* S.C. Ren & X.G. Zhang, *H. arundicum* Chowdhry, *H. bannaense* J.W. Xia & X.G. Zhang, *H. decorosum* R.F. Castañeda & al., *H. fici* L.G. Ma & X.G. Zhang, *H. indicum*, *H. neolitseae* S.C. Ren & X.G. Zhang, *H. phellodendri* Jian Ma & X.G. Zhang, *H. ponapense*, *H. schimae* Y.D. Zhang & X.G. Zhang, *H. tsoongiodendronis* L.G. Ma & X.G. Zhang (Zhang & al. 2010; Ma & al. 2012a,b; Ren & al. 2012; Xia & al. 2012; Zhang 2018).

Among the 19 *Heteroconium* species, only *H. ponapense* Matsush. and *H. indicum* Varghese & V.G. Rao are resemble *H. simile* in having predominately 1-septate conidia. However, *H. ponapense* differs by its obclavate to ellipsoid, brown, longer (12–24 µm) conidia (Matsushima 1983), while *H. indicum* differs by its larger (23–42.5 × 8.5–10.5 µm), fusiform to cylindrical, pale brown to reddish brown conidia (Varghese & Rao 1980).

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